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(71)出願人 000106771

シーシーアイ株式会社
岐阜県関市新迫間12番地

(72)発明者 大平 康幸

岐阜県羽島郡岐南町八剣7丁目148番地
シーシーアイ株式会社内

(72)発明者 堀 光雄

岐阜県羽島郡岐南町八剣7丁目148番地
シーシーアイ株式会社内

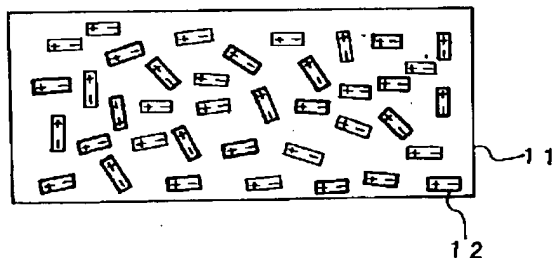
(74)代理人 弁理士 廣江 武典

(54)【発明の名称】 制振材

(57)【要約】

【課題】 優れた振動エネルギー吸収能力を有する制振材を提供すること。

【解決手段】 制振材を構成する樹脂マトリックス11中に、前記樹脂マトリックス11における双極子モーメント量を増加させる活性成分を配合したものであることを特徴とする。



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【特許請求の範囲】

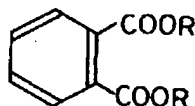
【請求項1】 制振材を構成する樹脂マトリックス中に、前記樹脂マトリックスにおける双極子モーメント量を増加させる活性成分を配合したものであることを特徴とする制振材。

【請求項2】 活性成分が、メルカプトベンゾチアジル基を含む化合物の中から選ばれた1種若しくは2種以上であることを特徴とする請求項1記載の制振材。

【請求項3】 活性成分が、ベンゾトリアゾール基を持つ化合物の中から選ばれた1種若しくは2種以上であることを特徴とする請求項1記載の制振材。

【請求項4】 活性成分が、下記構造を有するフタル酸エステルの中から選ばれた1種若しくは2種以上であることを特徴とする請求項1記載の制振材。

【化1】



(尚、式中Rは、フェニル基、シクロヘキシル基、シクロペンチル基、シクロペンチル基、4-メチルシクロヘキシル基のいずれか、またはこれらの基のいずれか2種である。)

【請求項5】 周波数110Hzにおける誘電損率が50以上であることを特徴とする請求項1、2、3または4記載の制振材。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、自動車、内装材、建材、家電機器などの振動の発生する部分に適用される優れた振動エネルギー吸収性能を有する制振材に関する。

【0002】

【従来の技術及び発明が解決しようとする課題】従来、振動エネルギーを吸収する材料としては、塩化ビニル系樹脂に可塑剤を添加した軟質の塩化ビニル系樹脂を素材とするものが知られている。

【0003】この軟質塩化ビニル系樹脂は、添加する可塑剤の種類や添加量を変えることにより、損失正接が最大となる温度を任意に調節できるというメリットがある反面、損失正接の最大値そのものが低く、振動エネルギーを吸収する能力はあまり高くないという課題を有していた。

【0004】本発明者は、自動車、内装材、建材、家電機器などの振動の発生する部分に適用される優れた振動エネルギー吸収性能を有する制振材について、鋭意研究を重ねた結果、制振材を構成する樹脂マトリックスにおける双極子モーメント量が、当該制振材の振動エネルギー吸収性能に深い関係を持っており、樹脂マトリックスにおける双極子モーメント量を多くすることで、当該制

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振材の振動エネルギー吸収性能を向上させることができることを見出した。

【0005】さらに発明者は、この研究を通して当該制振材の誘電損率と振動エネルギー吸収性能とについても相互に関係性があり、誘電損率が高いものほど、振動エネルギー吸収性能が高いということを見出したのである。

【0006】本発明は、上述の知見に基づくことで完成されたものであり、優れた振動エネルギー吸収能力を有する制振材を提供することを目的とするものである。

【0007】

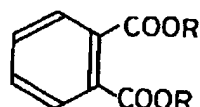
【課題を解決するための手段】上記目的を達成するため、請求項1記載の発明は、制振材を構成する樹脂マトリックス中に、前記樹脂マトリックスにおける双極子モーメント量を増加させる活性成分を配合したものであることを特徴とする制振材をその要旨とした。

【0008】請求項2記載の発明は、活性成分が、メルカプトベンゾチアジル基を含む化合物の中から選ばれた1種若しくは2種以上であることを特徴とする制振材をその要旨とした。

【0009】請求項3記載の発明は、活性成分が、ベンゾトリアゾール基を持つ化合物の中から選ばれた1種若しくは2種以上であることを特徴とする制振材をその要旨とした。

【0010】請求項4記載の発明は、活性成分が、下記構造を有するフタル酸エステルの中から選ばれた1種若しくは2種以上であることを特徴とする制振材をその要旨とした。

【化2】



(尚、式中Rは、フェニル基、シクロヘキシル基、シクロペンチル基、シクロペンチル基、4-メチルシクロヘキシル基のいずれか、またはこれらの基のいずれか2種である。)

【0011】請求項5記載の発明は、周波数110Hzにおける誘電損率が50以上であることを特徴とする制振材をその要旨とした。

【0012】

【発明の実施の形態】以下、本発明の制振材について詳しく説明する。本発明の制振材は、当該制振材を構成する樹脂マトリックス中に、双極子モーメント量を増加させる活性成分を配合したものである。

【0013】樹脂マトリックスを構成する樹脂成分としては特に限定されないが、自動車、内装材、建材、家電機器などの振動の発生する部分の使用時における温度において、良好な振動エネルギーの吸収性能が発揮されるものが好ましい。具体的にはポリ塩化ビニル、ポリエチ

レン、ポリプロピレン、エチレン-酢ビ共重合体、ポリメタクリル酸メチル、ポリフッ化ビニリデン、ポリイソブレン、ポリスチレン、スチレン-ブタジエン-アクリロニトリル共重合体、スチレン-アクリロニトリル共重合体、アクリロニトリル-ブタジエンゴム(NBR)、スチレン-ブタジエンゴム(SBR)、ブタジエンゴム(BR)、天然ゴム(NR)、イソブレンゴム(IR)などの高分子材料、これらをブレンドしたものなどを挙げることができる。中でもポリ塩化ビニルは、成形性がよく、安価である点で好ましい。

【0014】これらの樹脂成分により構成される樹脂マトリックスは、振動エネルギーが加わることで、図2に示すように樹脂マトリックス11内部の存在する双極子12に変位が生じる。双極子12に変位が生じるとは、樹脂マトリックス11内部における各双極子12が回転したり、位相がズレたりすることをいう。

【0015】図1に示すような振動エネルギーが加わる前の樹脂マトリックス11内部における双極子12の配置状態は安定な状態にあると言える。ところが、図2に示すように、振動エネルギーが加わることで、樹脂マトリックス内部の存在する双極子12に変位が生じたとき、樹脂マトリックス11内部における各双極子12は不安定な状態に置かれることになり、各双極子12は、図1に示す安定な状態に戻ろうとする。

【0016】このとき、エネルギーの消費が生じるのである。こうした、樹脂マトリックス内部における双極子の変位、双極子の復元作用によるエネルギー消費を通じて、振動減衰といった効果が生じるものと考えられる。

【0017】このような振動減衰のメカニズムを考えると、図1及び図2に示すような樹脂マトリックス11内部における双極子モーメントの量が、振動減衰に大きく関与していることが解る。すなわち樹脂マトリックス11内部における双極子モーメントの量が大きいとき、その樹脂マトリックス11の振動減衰効果、振動エネルギーの吸収性能は高くなるのである。

【0018】上述した樹脂成分における双極子モーメントの量は、樹脂成分の種類により様々に異なっている。また、樹脂マトリックスに同一の樹脂成分を用いたとしても、振動エネルギーが加わったときの温度により、樹脂マトリックスに生じる双極子モーメントの量は変わる。また、樹脂マトリックスに加わる振動エネルギーの大小によっても、双極子モーメントの量は変わる。このため、ある用途の制振材として適用するときの温度、振動エネルギーの大きさなどを考慮して、そのとき最も大きな双極子モーメント量となる樹脂成分を選択して用いるのが望ましい。

【0019】ただ、樹脂マトリックスを構成する樹脂成分の選択に際しては、樹脂マトリックスにおける双極子モーメント量だけに限らず、当該制振材の適用される用途や使用形態に応じて、取り扱い性、成形性、入手容易

性、温度性能(耐熱性や耐寒性)、耐候性、価格なども考慮するのが望ましい。

【0020】この樹脂マトリックスを構成する樹脂成分に、樹脂マトリックスにおける双極子モーメント量を増加させる活性成分が配合されているのである。活性成分とは、樹脂マトリックスにおける双極子モーメントの量を飛躍的に増加させる成分であり、当該活性成分そのものが双極子モーメント量が大きいもの、あるいは活性成分そのものの双極子モーメント量は小さいが、当該活性成分を配合することで、樹脂マトリックスにおける双極子モーメント量を飛躍的に増加させることができる成分をいう。

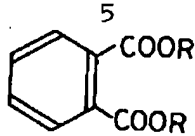
【0021】例えば所定の温度条件、振動エネルギーの大きさとしたときの、樹脂マトリックス11に生じる双極子モーメントの量が、これに活性成分を配合することで、図3に示すように、同じ条件の下で3倍とか、10倍とかいった量に増加することになるのである。これに伴って、前述の振動エネルギーが加わったときの双極子の復元作用によるエネルギー消費量も飛躍的に増大することになり、予測を遥かに超えた振動減衰効果が生じることになると考えられる。

【0022】このような作用効果を導く活性成分としては、例えばN、N-ジシクロヘキシルベンゾチアジール-2-スルフェンアミド、2-メルカプトベンゾチアゾール(MBT)、ジベンゾチアジルスルフィド(MBT S)、N-シクロヘキシルベンゾチアジール-2-スルフェンアミド(CBS)、N-tert-ブチルベンゾチアジール-2-スルフェンアミド(BBS)、N-オキシジエチレンベンゾチアジール-2-スルフェンアミド(OBS)、N、N-ジイソプロピルベンゾチアジール-2-スルフェンアミド(DPBS)などのメルカプトベンゾチアジール基を含む化合物、

【0023】ベンゼン環にアゾール基が結合したベンゾトリアゾールを母核とし、これにフェニル基が結合した2-{2'-ハイドロキシ-3'-(3'', 4'', 5'', 6''-テトラハイドロフタリミドメチル)-5'-メチルフェニル}-ベンゾトリアゾール(2HPMMB)、2-{2'-ハイドロキシ-5'-メチルフェニル}-ベンゾトリアゾール(2HMPB)、2-{2'-ハイドロキシ-3'-tert-ブチル-5'-メチルフェニル}-5-クロロベンゾトリアゾール(2HBMPB)、2-{2'-ハイドロキシ-3', 5'-ジtert-ブチルフェニル}-5-クロロベンゾトリアゾール(2HDBPCB)などのベンゾトリアゾール基を持つ化合物、

【0024】あるいは、下記構造を有するフタル酸エステルの中から選ばれた1種若しくは2種以上を挙げることができる。

【化3】



(尚、式中Rは、フェニル基、シクロヘキシル基、シクロペンチル基、シクロヘプチル基、4-メチルシクロヘキシル基のいずれか、またはこれらの基のいずれか2種である。)

【0025】活性成分における双極子モーメント量は、樹脂マトリックスにおける双極子モーメント量と同様に活性成分の種類により様々に異なる。また、同一の活性成分を用いたとしても、振動エネルギーが加わったときの温度により、樹脂マトリックスに生じる双極子モーメントの量も変わる。また、樹脂マトリックスに加わる振動エネルギーの大小によっても、双極子モーメントの量は変わる。このため、ある用途の制振材として適用するときの温度、振動エネルギーの大きさを考慮して、そのとき最も大きな双極子モーメント量となる活性成分を選択して用いるのが望ましい。

【0026】尚、樹脂マトリックスに配合する活性成分を決定するに当たり、活性成分と樹脂マトリックスを構成する樹脂成分との相溶し易さ、すなわちSP値を考慮し、その値の近いものを選択すると良い。

【0027】また、樹脂マトリックス中には、振動エネルギー吸収性能を向上させる目的で、マイカ鱗片、ガラス片、グラスファイバー、カーボンファイバー、炭酸カルシウム、バライト、沈降硫酸バリウム等のフィラーを充填することもできる。

【0028】本発明の制振材は、上記樹脂成分及び活性成分、並びに必要に応じてフィラーを配合することで得られるが、その際には熱ロール、バンバリーミキサー、二軸混練機、押し出し機などの従来公知の熔融混合する装置を用いることができる。

【0029】上記の如く、樹脂マトリックスに活性成分が配合された制振材は、樹脂マトリックスにおける双極子モーメントの量が飛躍的に増加し、もって優れた振動エネルギー吸収性能を発揮するに至るのであるが、この

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制振材における双極子モーメントの量は、図4に示すA-B間における誘電率(ϵ')の差として表される。すなわち図4に示すA-B間における誘電率(ϵ')の差が大きければ大きいほど、双極子モーメントの量が多いということになる。

【0030】さて、図4は誘電率(ϵ')と誘電損率(ϵ'')との関係を示したグラフであるが、このグラフに示す誘電率(ϵ')と誘電損率(ϵ'')との間には、誘電損率(ϵ'')=誘電率(ϵ') \times 誘電正接($\tan \delta$)といった関係が成り立っている。

【0031】本発明者は、制振材についての研究を通して、ここでいう誘電損率(ϵ'')が高ければ高いほど、振動エネルギー吸収性能も高いということを見出したのである。換言すれば、高分子の電子物性を表す誘電正接($\tan \delta$)と力学的な弾性を示す弾性正接($\tan \delta$)とがほぼイコールの関係にあることを見いだしたのである。

【0032】この知見に基づいて、上述の制振材における誘電損率(ϵ'')を調べたところ、周波数110Hzにおける誘電損率が50以上であるとき、当該制振材の弾性正接($\tan \delta$)の値も高く、優れた振動エネルギー吸収性能を有していることが解った。

【0033】この関係は、いくつかの具体的な制振材について、誘電損率(ϵ'')と弾性正接($\tan \delta$)とを測定した実験結果(表1に示す)からも明らかである。尚、表1に示す誘電損率(ϵ'')と弾性正接($\tan \delta$)の測定は、誘電損率(ϵ'')の測定がインピーダンス/ゲイン・フェーズアナライザー4194A、横河ヒューレット・パッカード株式会社製の測定装置を用い、弾性正接($\tan \delta$)の測定が、レオバイブロン、DDV-25FP、株式会社オリエンティック製の測定装置を用いた。尚、測定は、20°C、40°C及び60°Cの各温度で行い、その場合の周波数は110Hzとした。

【0034】

【表1】

【表1】

各温度における $\tan\delta$ と誘電損失

試料名	温度	20℃		40℃		60℃	
		$\tan\delta$	誘電損失	$\tan\delta$	誘電損失	$\tan\delta$	誘電損失
サンプル1	PVC+DCHP(100重量部)	0.25	24	2.00	141	1.80	120
サンプル2	PVC+DPP(100重量部)	0.23	21	1.95	122	1.20	61
サンプル3	PVC+CBS(100重量部)	0.20	18	1.65	107	1.40	96
サンプル4	PVC+HBS(100重量部)	0.15	10	1.50	110	1.85	130
サンプル5	PVC+HBT(100重量部)	0.10	8	1.00	68	1.05	99
サンプル6	PVC+ECDA(100重量部)	0.30	19	2.05	131	1.20	102
サンプル7	PVC+DOP(40重量部)+DCHP(100重量部)	2.00	98	0.25	28	0.15	18
サンプル8	PVC+DOP(40重量部)+DCHBSA(100重量部)	0.70	45	2.80	220	0.75	52
サンプル9	PVC+DOP(40重量部)+ZEPMB(100重量部)	0.10	18	0.50	30	3.20	246
サンプル10	PVC単体	0.01	13	0.02	16	0.03	20
サンプル11	PVC+DOP(40重量部)	0.55	31	0.78	38	0.05	11

【0035】

【発明の効果】本発明の制振材は、制振材を構成する樹脂マトリックス中に活性成分が配合されて、前記樹脂マトリックスにおける振動エネルギーを消費する双極子モーメント量が飛躍的に増加しており、優れた振動エネルギー吸収性能が発揮されるようになっている。

【0036】またこの制振材は、周波数110Hzにおける誘電損失率が50以上であることから、自動車、内装材、建材、家電機器などの振動の発生する部分に適用されて、優れた振動エネルギー吸収性能を発揮するようになっている。

【図面の簡単な説明】

*【図1】樹脂マトリックスにおける双極子を示した模式図。

【図2】振動エネルギーが加わったときの樹脂マトリックスにおける双極子の状態を示した模式図。

【図3】活性成分が配合されたときの樹脂マトリックスにおける双極子の状態を示した模式図。

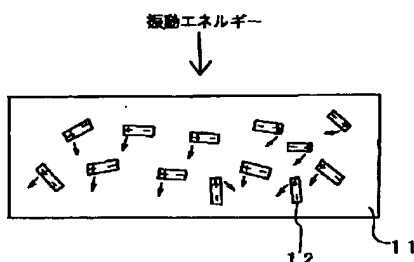
【図4】樹脂マトリックスにおける誘電率(ϵ')と誘電損失率(ϵ'')との関係を示したグラフ。

【符号の説明】

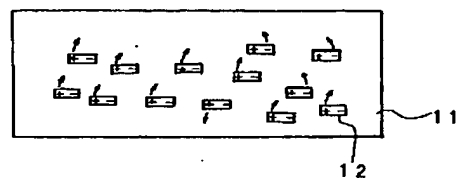
11・・・樹脂マトリックス

12・・・双極子

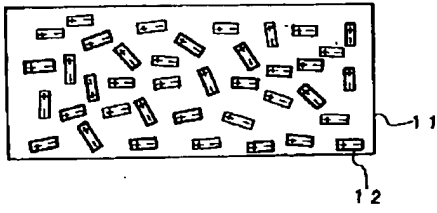
【図1】



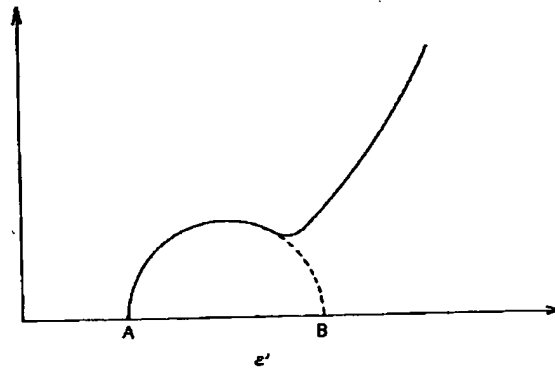
【図2】



【図3】



【図4】



PATENT ABSTRACTS OF JAPAN

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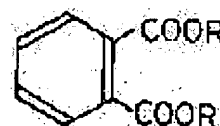
(72)Inventor : OHIRA YASUYUKI
HORI MITSUO

(54) DAMPING MATERIAL

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a damping material that comprises a resin matrix with which a particular active component is compounded, and has noticeably increased dipole moment, which consumes vibration energy, and excellent vibration energy absorption performance.

SOLUTION: This damping material comprises a resin matrix compounded with an active component that increases dipole moment of the matrix. The active component is preferably composed of one or more compounds selected from those which contains a mercaptobenzothiazole group (e.g. N-dicyclohexylbenzothiazol-2-sulfonamide, etc.), one or more compounds selected from those which have a benzotriazole group, or one or more compounds selected from phthalic esters of the formula (R is phenyl, cyclohexyl, cyclopentyl, cycloheptyl, or 4-methylcyclohexyl).



LEGAL STATUS

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention absorbs a mechanical energy and energy, such as heat energy, a light energy, or electrical energy, and relates to an energy-conversion constituent with the function to change.

[0002]

[Description of the Prior Art] Conventionally, the elastic vinyl chloride system resin which added the plasticizer to the vinyl chloride system resin is known as a material which absorbs vibrational energy like a sound deadener.

[0003] This elasticity vinyl chloride system resin is consuming vibrational energy as frictional heat in the interior of a resin, and the attenuation is measured.

[0004] However, absorption of sufficient vibration and attenuation were not completed with this material.

[0005] Moreover, what consists of rock wool is known as a material which absorbs the energy of sound like a sound absorbing material. In case it passes while sound collides with a fiber front face if it is in this acoustic material, it is consuming as frictional heat, and the attenuation is measured.

[0006] However, in this sound absorbing material, when it was going to secure sufficient absorption-of-sound nature, a certain amount of thickness was needed and sound of the low frequency following 500 moreHz was not able to be absorbed sound certainly.

[0007] Moreover, what distributed the staple fiber in the foam as shown in JP,6-300071,A as a material which absorbs striking energy like impact-absorption material is proposed. The staple fiber contained in a foam acts like a binder, and this impact-absorption material raises the tensile strength of this foam, and suppresses the crack of the foam by the impact load concentrated on a part while a shock absorption is made, when the foam collapses gradually to the shock.

[0008] However, if it was in this impact-absorption material, in order to secure sufficient impact-absorption performance, fixed thickness and volume were needed, and it has not been used for the use which cannot secure the space.

[0009] Moreover, as a material which absorbs electromagnetic wave energy like an electromagnetic shielding material, there are some which were shown, for example in JP,5-255521,A. The molecule which constitutes material by the ultraviolet rays which absorbed ultraviolet rays with a wavelength of 250-400nm, and were once absorbed excites this material to an excitation state, and it consists of a ultraviolet-absorption nature compound with the system of changing and emitting to heat energy.

[0010] When producing a ultraviolet-absorption sheet using this material, in order to secure sufficient absorptivity generally, even if few It was considering as the thickness of the grade of a micron. For this reason, the transmittance of a visible ray will be spoiled and there was fault that sufficient luminosity was not obtained.

[0011] From such a situation, the sheet which does not spoil a luminosity more thinly was called for between the industries.

[0012] Moreover, there are ceramics etc. as a conversion material of the electrical energy which constitutes the actuator applied, for example to a dot impact printer etc. The piezoelectricity effect (variation rate amount) pulled out by such material was very small, and highly efficient-ization was called for more.

[0013] Moreover, there are some which were shown in JP,5-5215,A as a material which absorbs and changes heat energy like endothermic fiber. This endothermic material is a polymer which consists of straight chain aliphatic carboxylic-acid components, such as a polyethylene horse mackerel peat, a poly pentamethylene horse mackerel peat, and a polytetramethylene GURUTA rate, and a straight chain aliphatic diol component, and endothermic nature discovers it by the heat of fusion absorbed when the polymer concerned dissolves.

[0014] However, if it is in this endothermic material, in order to secure sufficient endothermic nature, a lot of polymers were needed.

[0015] Moreover, it is there being viscous fluid which makes glycols a principal component, and forming electric field in this viscous fluid, and is made to absorb shock energy most effectively and certainly as a liquid material which absorbed and changes vibrational energy, by changing the viscosity of the viscous fluid concerned suitably according to a shock mode as shown, for example in JP,5-332047,A.

[0016] However, since it corresponded to this when huge shock energy, such as a big earthquake, joins the structure if it is in this liquid material, a lot of liquid material was required. And it had become an amount with the amount used immense since oxidization degradation is carried out, as for the liquid material concerned, a performance falls with the passage of time, and the material concerned must be replaced after progress of a predetermined period. The material with which sufficient shock energy-absorption nature is obtained from such a situation even when it is more effective and is little was called for.

[0017] Moreover, the viscous fluid which makes glycols a principal component is used for high latent-heat media, such as transformer coolant, an engine coolant, and die cooling liquid. In these coolant, it is supposed that refrigeration capacity is also high, so that the latent heat is high, as shown in the following formula.

$(**H\text{-radiographic})/V=(SP)^2 **H$: The latent heat, an SP:SP value (solubility parameter)
 SP value shows polarity and becomes so large that there is much dipole. Although this SP value of water is the largest, since use of water causes the evil of making a radiator corrode, it is not suitable for use. On the other hand, although glycols were excellent in the rustproof effect, it had the technical problem that the latent heat was low.

[0018] If it is in the conventional energy-conversion constituent, in order [which was described above] to obtain insufficiency [a performance] and a predetermined performance like, there was which fault that needs a certain amount of thickness and capacity.

[0019] this invention is made in view of such a situation, absorbs a mechanical energy and energy, such as heat energy, a light energy, or electrical energy, and it has the function to change, and the performance is very good, and it aims at offering the energy-conversion constituent which can make thickness and capacity thinly or small.

[0020]

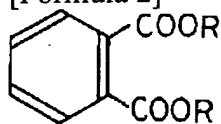
[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention according to claim 1 made the summary the energy-conversion constituent characterized by blending the active ingredient which makes the amount of dipole moments in the aforementioned base material increase into a base material.

[0021] The energy-conversion constituent characterized by invention according to claim 2 being one sort chosen from the compounds with which an active ingredient contains a mercapto benzo thiazyl machine, or two sorts or more was made into the summary.

[0022] The energy-conversion constituent characterized by invention according to claim 3 being one sort chosen from the compounds in which an active ingredient has a benzotriazol machine, or two sorts or more was made into the summary.

[0023] The energy-conversion constituent characterized by invention according to claim 4 being one sort as which the active ingredient was chosen from the phthalic esters which have the following structure, or two sorts or more was made into the summary.

[Formula 2]



(In addition, the inside R of a formula is any two sorts, a phenyl group, a cyclohexyl machine, a cyclopentyl group, a cyclo PEPUCHIRU machine, 4-methyl cyclohexyl machine, or these bases.)

[0024] Invention according to claim 5 made the summary the energy-conversion constituent characterized by the dielectric loss factor in the frequency of 110Hz being 50 or more.

[0025]

[Embodiments of the Invention] Hereafter, the gestalt of operation of the energy-conversion constituent of this invention is explained in detail. This energy-conversion constituent For example, an unrestraining type damping sheet, a restrained type damping sheet, The high-damping material used for the use of a damping paint, damping paper, an asphalt system sound deadener (automobile floor), an asphalt passage (silence passage), etc., An absorption-of-sound film, absorption-of-sound fiber (a fiber, strand), an absorption-of-sound foam, The sound absorbing material, training shoes which are used for the use of absorption-of-sound paper, an absorption-of-sound molding object, etc., A protector, a headgear, gypsum, a mat, a supporter, the object for bicycles, or the grip and saddle for motorbikes, The impact-absorption material used for the use of slippers, a gun bottom, shoulder putt, a bulletproof vest, etc., The electromagnetic shielding material used for the use of the rubber vibration insulator material and the X-ray absorption sheet which are used for the use of quake-absorbing rubber, the cast for vibrationproofing, etc., a ultraviolet-absorption sheet, etc., The actuator material used for uses, such as a motor and a dot impact printer, (polar material), The viscous fluid in the endothermic material and quake-absorbing equipment which are used for uses, such as endothermic fiber and an endothermic nature pellet engine-mount liquid, shock-absorber oil, the power-transformer coolant, an engine coolant, the heat carrier for floor heating, and solar one -- business -- it is applicable as material, such as a polar liquid used for the use of a heat carrier etc.

[0026] This energy-conversion constituent blends the active ingredient which makes the amount of dipole moments in the aforementioned base material increase into a base material.

[0027] Although not limited especially as a base material, when the energy-conversion constituent concerned is applied to a high-damping material, for example, To a base material, a polyvinyl chloride, polyethylene, polypropylene, an ethylene-vinyl acetate copolymer, A polymethyl methacrylate, a polyvinylidene fluoride, a polyisoprene, A polystyrene and styrene-Butadiene Acrylonitrile, A styrene acrylonitrile copolymer, acrylonitrile-butadiene rubber (NBR), Polymeric materials, such as a styrene butadiene rubber (SBR), butadiene rubber (BR), natural rubber (NR), and polyisoprene rubber (IR), the thing which blended these can be used. The moldability of a polyvinyl chloride is good especially and it is desirable at a cheap point.

[0028] Moreover, when applying the energy-conversion constituent concerned to a sound absorbing material, impact-absorption material, an electromagnetic shielding material, endothermic material, a polar material, etc., the above-mentioned polymeric materials same with the aforementioned high-damping material can be used for a base material. When using especially as a sound absorbing material, absorption-of-sound nature can be raised more by making a foaming agent add and foam to above-mentioned polymeric materials, and considering as an open-cell type foam or foaming fiber.

[0029] Moreover, when applying the energy-conversion constituent concerned to a rubber vibration insulator etc., rubber, such as acrylonitrile-butadiene rubber (NBR), a styrene butadiene rubber (SBR), butadiene rubber (BR), natural rubber (NR), and polyisoprene rubber (IR), can be used for a base material. Moreover, when applying as a polar liquid, glycols are used as a base material.

[0030] Moreover, into a base material, matter, such as other, for example, a mica, scales [component / above-mentioned], the piece of glass, glass fiber, a carbon fiber, a calcium carbonate, a baryte, and precipitated barium sulfate, a corrosion inhibitor, a color, an antioxidant, an antielectric agent, a stabilizer, a wetting agent, etc. can be added suitably if needed.

[0031] The base material constituted by the above-mentioned component is that energy, such as vibration, sound, a shock, electrical and electric equipment, a pressure, light, and heat, is added, and a variation rate produces it in the dipole 12 in which the base material 11 interior exists as shown in drawing 2. Each dipole [in / the base material 11 interior / that a variation rate arises in a dipole 12] 12 rotates, or a phase shifts and **** squirrel ***** is said.

[0032] It can be said that the arrangement state of the dipole 12 in the base material 11 interior before energy as shown in drawing 1 is added is in a stable state. However, as shown in drawing 2, when a variation rate arises by energy being added in the dipole 12 in which the interior of a base material exists, each dipole 12 in the base material 11 interior will be put on an unstable state, and tends to return to the stable state which shows each dipole 12 in drawing 1.

[0033] Consumption of energy arises at this time. It is thought through the energy expenditure by the variation rate of the dipole in the interior of such a base material, and restoration operation of a dipole that effects, such as periodic damping, absorption of sound, an impact absorption, vibrationproofing, electromagnetic wave absorption, or an endothermic, arise.

[0034] When considering absorption of such energy, and the mechanism of conversion, it turns out that the amount of the dipole moment in the base material 11 interior as shown in drawing 1 and drawing 2 is involving greatly. That is, when the amount of the dipole moment in the base material 11 interior is large, the energy absorption and the conversion performance which the base material 11 has become high.

[0035] The amount of the dipole moment in a base material changes variously with kinds of component which constitutes the base material mentioned above. Moreover, the amount of the dipole moment produced in a base material changes with temperature though the same base material component was used, when energy is added. Moreover, the amount of the dipole moment changes also by the kind of energy which joins a base material, and size. For this reason, it is desirable to choose suitably the base material component which serves as the biggest amount of dipole moments then, and to use it in consideration of the temperature when applying as an energy-conversion constituent of a certain use, the kind of energy, a size, etc.

[0036] However, it is desirable to take into consideration handling nature, a moldability, acquisition ease, a temperature performance (thermal resistance and cold resistance), weatherability, a price, etc. on the occasion of selection of the component which constitutes a base material according to the use and use form to which the amount of dipole moments in a base material and the energy-conversion constituent concerned are applied.

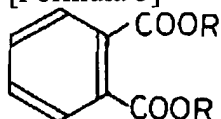
[0037] The active ingredient which makes the amount of dipole moments in a base material increase to the component which constitutes this base material is blended. Although an active ingredient is a component to which the amount of the dipole moment in a base material is made to increase by leaps and bounds and the amount of dipole moments of a large thing or the active ingredient itself has [the active ingredient concerned itself] the small amount of dipole moments, the component to which the amount of dipole moments in a base material can be made to increase by leaps and bounds by blending the active ingredient concerned is said.

[0038] For example, the amount of the dipole moment produced in the base material 11 when considering as predetermined temperature conditions and the size of energy will increase to 3 times, 10 times, or the said amount under the same conditions, as shown in drawing 3 by blending an active ingredient with this. In connection with this, the energy expenditure by restoration operation of a dipole when the above-mentioned energy is added will also increase by leaps and bounds, and is considered that absorption of the energy far beyond prediction and a conversion performance will arise.

[0039] As an active ingredient which draws such an operation effect For example, N and N-dicyclohexylbenzothiazyl-2-sulfonamide (DCHBSA), 2-mercaptobenzothiazole (MBT), a

dibenzothiazyl sulfide (MBTS), N-cyclohexylbenzothiazyl-2-sulfonamide (CBS), N-tert-butylbenzothiazyl-2-sulfonamide (BBS), The compound, [0040] containing mercapto benzo thiazyl machines, such as N-oxy-diethylene benzo thiazyl-2-sulfenamide (OBS), N, and N-diisopropyl benzothiazyl-2-sulfenamide (DPBS) The benzotriazol which the azole machine combined with the benzene ring is made into a mother nucleus. The 2-{2'-hide ROKISHI-3'-(3", 4", 5"6" tetrahydro free-wheel-plate RIMIDE methyl)-5'-methylphenyl}-benzotriazol which the phenyl group combined with this (2HPMMB), A 2-{2'-hide ROKISHI-5'-methylphenyl}-benzotriazol (2HMPB), A 2-{2'-hide ROKISHI-3'-t-butyl-5'-methylphenyl}-5-chlorobenzo triazole (2HBMPCB), A compound with benzotriazol machines, such as a 2-{2'-hide ROKISHI-3' and 5'-G t-buthylphenyl}-5-chlorobenzo triazole (2HDBPCB), [0041] Or one sort chosen from the phthalic esters which have the following structure, or two sorts or more can be mentioned.

[Formula 3]



(In addition, the inside R of a formula is any two sorts, a phenyl group, a cyclohexyl machine, a cyclopentyl group, a cyclo PEPUCHIRU machine, 4-methyl cyclohexyl machine, or these bases.)

[0042] The amount of dipole moments in an active ingredient changes variously with kinds of active ingredient like the amount of dipole moments in a base material. Moreover, the amount of the dipole moment produced in a base material also changes with temperature though the same active ingredient was used, when energy is added. Moreover, the amount of the dipole moment changes also by the kind of energy which joins a base material, and size. For this reason, it is desirable to choose and use the active ingredient which serves as the biggest amount of dipole moments then in consideration of the temperature when applying as an energy-conversion constituent of a certain use, the kind of energy, and a size.

[0043] In addition, when using polymeric materials as a base material like a high-damping material or a sound absorbing material, it is good to face to determine the active ingredient blended with this base material, and to choose a thing with the near value in consideration of the ease of dissolving of an active ingredient and the component which constitutes a base material, i.e., SP value.

[0044] The amount of the dipole moment in a base material increases the energy-conversion constituent with which the active ingredient was blended with the base material like the above by leaps and bounds, and it is expressed as a difference of the dielectric constant between A-B which shows [it comes to demonstrate the energy-absorption performance and the energy-conversion performance which it had and excelled] the amount of the dipole moment in this energy-conversion constituent to drawing 4 although (epsilon'). Namely, the more the difference of the dielectric constant between A-B shown in drawing 4 (epsilon') is large, the more it will be said that the amount of the dipole moment is large.

[0045] Now, although drawing 4 is the graph which showed the relation between a dielectric constant (epsilon') and a dielectric loss factor (epsilon''), between the dielectric constants (epsilon') and dielectric loss factors (epsilon'') which are shown in this graph, a relation called a dielectric loss factor (epsilon'') = dielectric constant (epsilon') x dielectric dissipation factor (tandelta) is realized.

[0046] Through the research on an energy-conversion constituent, the more this invention person had the high dielectric loss factor (epsilon'') here, the more he found out that energy absorption and a conversion performance are also high. When the dielectric loss factor (epsilon'') in an above-mentioned energy-conversion constituent was investigated based on this knowledge and the dielectric loss factor in the frequency of 110Hz is 50 or more, it turns out that the energy absorption of the energy-conversion constituent concerned and a conversion performance are also high.

[0047] The energy-conversion constituent of this invention can obtain blending a corrosion inhibitor, a color filler, etc. the above-mentioned base material component, an active ingredient, and if needed or a compound by fabrication or carrying out spinning the shape of a film, fibrous, in the shape of a block,

etc. In addition, the above-mentioned base material component, an active ingredient, etc. can be blended, and fabrication, the forming method when carrying out spinning, or the spinning method can use a well-known method for this compound conventionally the shape of a film, fibrous, in the shape of a block, etc.

[0048]

[Example] Hereafter, the energy-conversion constituent of this invention is explained still more concretely according to one example shown in the drawing. What was shown in drawing 5 and drawing 6 carries out 100 weight sections addition of the N and N-dicyclohexylbenzothiazyl-2-sulfonamide (DCHBSA) at vinyl chloride resin, it is the damping sheet 20 sheet-sized in thickness of 1mm, and drawing 5 shows [an un-restraining type and drawing 6] the restrained type thing. These damping sheets 20 were what all demonstrates the absorptivity ability of the outstanding vibrational energy which exceeded prediction far from the conventional damping sheet.

[0049] It is the absorption-of-sound sheet 40 in which the absorption-of-sound staple fiber 41 which drawing 7 - drawing 9 showed the sound absorbing material, and drawing 7 carried out 100 weight sections addition of the DCHBSA at vinyl chloride resin, and is the absorption-of-sound sheet 30 sheet-sized in thickness of 1mm, and carried out spinning of what carried out 100 weight sections addition of the DCHBSA to drawing 7 at vinyl chloride resin was included in the sheet. Drawing 8 is the open-cell type foaming polyurethane moldings 50 which carried out 100 weight sections addition of the DCHBSA.

[0050] What is shown in drawing 10 arranges the absorption-of-sound sheet 30 of drawing 7 inside the acoustic material 60 which consists of a glass fiber 61 used conventionally. In this case, thickness of acoustic material 60 could be sharply made thin, and moreover, with the conventional acoustic material, the sound of the low frequency of 500 or less HZs which has not been absorbed was also able to be caught certainly, and was able to be absorbed.

[0051] Drawing 11 includes the aforementioned absorption-of-sound staple fiber 41 inside an open-cell type foaming polyurethane moldings. Drawing 12 and drawing 13 are the papers 70 or textiles 80 which milled or wove the aforementioned absorption-of-sound staple fiber 41 as a part of composition fiber. These have the outstanding absorption-of-sound nature, and are very useful as a wallplate or flooring.

[0052] The shoes 90 which are what carried out 100 weight sections addition of the DCHBSA at vinyl chloride resin, and constituted a part for the base 91 of shoes and a heel 92 are shown in drawing 14 . The shoes 90 which constituted a part for a base 91 and a heel 92 from such material are excellent in impact-absorption nature, and were effective in being hard to get tired, even if it walks for a long time.

[0053] The gypsum 100 which formed the nonwoven cloth layer 102 which becomes vinyl chloride resin from the staple fiber 101 which carried out spinning of what carried out 100 weight sections addition of the DCHBSA in drawing 15 was shown. Since according to this gypsum 100 the staple fiber 101 of the impact-absorption nature which constitutes the nonwoven cloth layer 102 absorbs this certainly even if the force joins the gypsum 100 concerned, the affected part can be certainly protected from a shock.

[0054] Drawing 16 and drawing 17 fabricate what carried out 100 weight sections addition of the DCHBSA as the upper flare or grip 120 of a saddle 110 of a bicycle to vinyl chloride resin. In this case, absorption removal of the shock which joins the upper flare or grip 120 of a saddle 110 of a bicycle is carried out certainly.

[0055] What is shown in drawing 18 can obtain endothermic nature fiber by fabricating what carried out 100 weight sections addition of the DCHBSA to vinyl chloride resin in the shape of a pellet, and carrying out melt spinning of this pellet 120 to it.

[0056] Drawing 19 shows the viscous fluid with which it filled up in casing of quake-absorbing equipment, and this casing, and 100 weight sections addition of the DCHBSA is carried out at the viscous fluid which makes ethylene glycol a subject. By having used this viscous fluid, the quake-absorbing effect of the same grade was able to be acquired in few amount than DCHBSA non-added viscous fluid.

[0057] Moreover, the high latent-heat medium applied to ethylene glycol by carrying out 100 weight

sections addition of the DCHBSA at the transformer coolant, an engine coolant, die cooling liquid, etc. was produced. if it is in this high latent-heat medium, it has the latent heat near water by addition of DCHBSA -- ***** -- rust -- hard -- it has the cooling effect which was moreover excellent Miniaturization of the cooler style itself, such as a radiator, can be measured by adopting such a high latent-heat medium.

[0058]

[Effect of the Invention] An active ingredient is blended into a base material, the amount of the dipole moment in the aforementioned base material is increasing the energy-conversion constituent of this invention by leaps and bounds, and the outstanding energy absorption and the outstanding conversion performance are demonstrated.

[0059] When the dielectric loss factor especially in the frequency of 110Hz is 50 or more, the energy-conversion constituent concerned comes to demonstrate the outstanding energy absorption and the outstanding conversion performance.

[Translation done.]

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 CLAIMS

[Claim(s)]

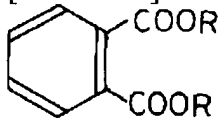
[Claim 1] The energy-conversion constituent characterized by blending the active ingredient which makes the amount of dipole moments in the aforementioned base material increase into a base material.

[Claim 2] The energy-conversion constituent according to claim 1 characterized by an active ingredient being one sort chosen from the compounds containing a mercapto benzo thiazyl machine, or two sorts or more.

[Claim 3] The energy-conversion constituent according to claim 1 characterized by being one sort chosen from the compounds in which an active ingredient has a benzotriazol machine, or two sorts or more.

[Claim 4] The energy-conversion constituent according to claim 1 characterized by an active ingredient being one sort chosen from the phthalic esters which have the following structure, or two sorts or more.

[Formula 1]



(In addition, the inside R of a formula is any two sorts, a phenyl group, a cyclohexyl machine, a cyclopentyl group, a cyclo PEPUCHIRU machine, 4-methyl cyclohexyl machine, or these bases.)

[Claim 5] The energy-conversion constituent according to claim 1, 2, 3, or 4 characterized by the dielectric loss factor in the frequency of 110Hz being 50 or more.

[Translation done.]